

Course 1208: Dermatology for the Allergist: Diagnosis and Therapeutics Boot Camp

Hand Outs for Hands-On Diagnostics: Patch Testing

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Learning Objectives:

1. Discuss common diagnostic tests applicable to eczemas
2. Outline basic skin care for allergic skin diseases and avoidance of pitfalls

I. Patch Test Allergens: Consider PT panels tailored to the specific patient's exposure history to improve the accuracy of the diagnosis.

A. Standardized test kits

T.R.U.E. Test

Allergeaze

Trolab

Hermal

Dormer

B. Personal items

C. Allergens from the cosmetic industry

D. Industrial allergens Kits for specific exposures (hairdresser, shoes, plants, photo allergens, vehicles, metals, antibiotics, corticosteroids, photoallergens etc)

The following tables itemize some of the occupational and exposure panels that are commercially available.

Special Occupational Patch Test Allergen Panels

Bakery

Dental screening – health care providers

Dental screening – patients

Hairdressing

Photographic chemicals

Allergen Panels Based Upon Specific Exposures

Cosmetics

Epoxy series

Eyelid Dermatitis

Footwear/shoes

Fragrance/perfumes

Isocyanates

Methacrylate series: adhesives, dental, nails, and others

Photoallergens

Photochemicals/photopatch

Plastics & glues

Rubber additives/chemicals

Sunscreens

Textile colors & finish

Medications, treatments, and food panels

Antibiotics/antimycotics

Corticosteroids

Local Anesthetics

Medicinal Substances

Antimicrobials/preservatives

External agents/emulsifiers

Food additives

Leg ulcer

Metal compounds and implants

Plants/compounds of natural origin

Test Concentrations for Some Non Standardized Patch Tests

Agent	Test Concentration
Leave on cosmetics -make up, perfume, moisturizer, antiperspirant -nail polish, after shave lotion, perfume, Mascara	As is As is, allow to dry
Wash off cosmetics (soap, shampoo)	1%-5%
Household products (detergents, cleansers, solvents)	0.1-1%
Topical medication Antibacterial, steroids	As is – 20%
Clothing, shoes, gloves	2 x 2 cm moisten in saline
Plants (leaf, flowers, pollen, bulb)	As is
Foods -cauliflower, clove, spice, fruit -garlic	As is 5%
Industrial products Household and industrial products should only be tested after determining their safety from material safety data sheet information and using non-irritating patch test concentrations based on an authoritative text.	Refer to Occupational Health Care Professional.

II. PREPARATION OF PATCH TEST SITE

- A. When possible, use upper back (concentration of standard allergens determined for back skin)
- B. Avoid midline of back
- C. Shave hair
- D. Clean with plain water (no alcohol or soap)

E. Dry before application

III. PREPARATION OF CHAMBERS

A. Lay out chambers (2 parallel rows of 5) with backing removed. You may place them on scanpore tape

B. Quantity of allergen:

5 mm ribbon of petrolatum based or 1 drop of liquid in filter paper disc

C. Antigens on the far left of your application will be applied on the far right of the patient

IV. PATIENT INSTRUCTIONS

A. Do not shower, do work or exercise that will wet or loosen patches

B. For severe itching or pain, call MD. Otherwise, remove painful patch only. Do not disturb other patches

C. Patches will be removed after 2 days & first reading done 30 minutes after removal

D. Between readings, do not wash your back

E. Second reading may be done 72, 96 hr or 7 days

F. Report new positive results up to 2-3 weeks

V. Patch Test Reading:

The initial reading of patch tests should be done 48 hours after their application when the patches are removed. Read tests 30 minutes after removal of the patch to allow erythema, due to occlusion of the tape and/or chamber, to resolve. An additional reading 3 to 4 days (72-96 hours) after the initial application should be performed, and occasionally on days 6 or 7 for certain contactants including metals, some antibiotics and TCS that may yield late reactions. A collaborative study documented that approximately 30% of relevant allergens that were negative at the 48-hour reading become positive at a 96-hour reading

A. Allergens associated with late reactions

1. Metals

- a. Gold
- b. Potassium Dichromate
- c. Nickel
- d. Cobalt

2. Topical Antibiotics

- a. Neomycin
- b. Bacitracin

3. Topical Corticosteroids

4. PPD

B. On the FIRST READING

- 1. Remove patches
- 2. With serrated template, leave small strip of tape for orientation
- 3. Mark sites as discs are removed
- 4. Read after 15-30 minutes
- 5. Score each site & record
- 6. Inquire about disturbance of patches & record
- 7. Relabel patches

C. Patch Test scoring system developed by the by the International Contact Dermatitis Research Group.

(-) Negative reaction



(?+) Doubtful reaction with faint erythema only



(1+) Weak positive reaction with nonvascular erythema, infiltration, possibly papules



(2+) Strong positive reaction with vesicular erythema, infiltration, and papule



(3+) Extreme positive reaction with intense erythema and infiltration, coalescing vesicles, bullous reaction



(IR) Irritant reaction

(NT) Not tested

VI. False-positive reactions:

Many variables contribute to the strength of the patch test reaction, including the concentration and potency of the allergen, the degree of subject sensitization, the length of application time, and the timing of the readings. False positive reactions may be encountered in

1. the “angry back” or “excited skin” syndrome: defined as false positive reactions adjacent to large true positive ones that induce contiguous skin inflammation and irritability.
2. the allergens that cross-react or co-sensitize in a multiple allergen template are tested in too close proximity.
3. irritating allergens.

Repeat the PT with greater separation of allergens if the initial reactions are not clinically relevant, as the false positive reactions are not reproducible when the triggering allergens are removed.

VII. False-negative reactions:

The frequency of false negative results is unknown, but is estimated to occur in up to 30% of patch-tested patients. Causes of false negative reactions include

1. too low a concentration of the allergen in the extract
2. use of the wrong carrier vehicle that resulted in insufficient penetration of the allergen, or inclusion of the wrong salt or version of the allergen
3. UV sunlight, e.g. tanning on site of the PT
4. Topical corticosteroid and Topical Calcineurin Inhibitor area of PT
5. Systemic corticosteroids (>20 mg/d prednisone) and other immunosuppressives, The suppression is not absolute, and if necessary, patch testing should be performed while on the lowest possible dose of the immunosuppressant medication.

VIII. Determine the relevance of a patch test by correlating the clinical and exposure history.

A positive patch test may be clinically relevant due to current or past exposures. Current relevance is defined as **definite** if the patch or use test with the suspected item is positive; **probable** if the antigen is present in known skin contactants and the clinical presentation is consistent with that exposure; or **possible** if skin contact with materials known to contain the allergen was likely. **Past** relevance is considered if the PT is positive but the exposure was in the past, and not the present.

IX. Patch Test concentration to Food

Allergen	Majamaa et al **	Niggemann et al ***	Spergel et al****
Milk	300 mg milk powder in 0.2 ml saline *	1 drop 3.5% milk	2 gm dry skim milk in 2 ml saline
Wheat, Barley, Rye, Oat	200 mg in 0.3 ml saline (20 mg in Finn chamber)	Wheat powder 1 gm/10 ml water	2 gm in 2 ml saline
Soy	200 mg in 0.3 ml saline	Soy bean milk	2 gm dry soy instant formula in 2 ml saline
Corn, Rice	Kennels dampened with saline		2 gm Corn meal or rice flour in 2 ml saline
Egg	40 mg lyophilized egg white in 0.2 ml saline	1 drop native egg white & yolk	2 gm dried egg white in 2 ml saline
Buckwheat	200 mg in 0.3 ml saline (20 mg in Finn chamber)		
Fruit, vegetables, meat			Commercial single ingredient baby food undiluted

** Majamaa et al. Allergy. 1999; 54 (8); 851-856

*** Niggemann B et al. Allergy. 2000; 55:281-285

**** Spergel et al. J Allergy Clin Immunol. 2002;109(2):363-368

Spergel et al. J Allergy Clin Immunol. 2005;95(4):336-343

Table 1. Revised European Task Force on Atopic Dermatitis (ETFAD) key for atopy patch test (APT) reading

—	Negative
?	Only erythema, questionable
+	Erythema, infiltration
++	Erythema, few papules
+++	Erythema, many or spreading papules
++++	Erythema, vesicles

K. Turjanmaa, U. Darsow, B. Niggemann, et al EAACI/GA2LEN Position paper: Present status of the atopy patch test. Allergy 2006; 61: 1377–1384

X. STRUCTURAL GROUPS OF CORTICOSTEROIDS: Cross reactivity based on 2 immune recognition sites- C 6/9 & C16/17 substitutions

<p>Class A (Hydrocortisone & Tixocortol pivalate: has C17 or C21 short chain ester) Hydrocortisone, -acetate, Tixocortol, Prednisone, Prednisolone, -acetate, Cloprednol, Cortisone, -acetate, Fludrocortisone, Methylprednisolone-acetate</p>
<p>Class B (Acetonides: has C16 C17 cis-ketal or –diol additions) Triamcinolone acetonide, -alcohol, Budesonide, Desonide, Fluocinonide, Fluocinolone acetonide, Amcinonide, Halcinonide</p>
<p>Class C (non-esterified Betamethasone; C16 methyl group) Betamethasone sodium phosphate, Dexamethasone, Dexamethasone sodium phosphate, Fluocortolone</p>
<p>Class D1 (C16 methyl group & halogenated B ring) Clobetasone 17-butyrate, -17-propionate Betamethasone-valerate, -dipropionate, Aclometasone dipropionate, Fluocortone caproate, -pivalate, mometasone furoate</p>
<p>Class D2 (labile esters w/o C16 methyl nor B ring halogen substitution) Hydrocortisone 17-butyrate, -17-valerate, -17-aceponate, -17-buteprate, methylprednisolone aceponate</p>
<p><i>Wilkinson, SM. Corticosteroid cross reactions: an alternative view. Contact dermatitis 2000;42:59-63.</i></p>

XI. Avoidance of Allergen

For cosmetic products, if PT identifies specific allergens, the patient is informed of these allergens and is asked to avoid them. However, typical allergen names are long, difficult to spell, commonly have numerous complex synonyms, and are often intimidating for patients and compliance with allergen avoidance is frequently difficult. To improve compliance, there are currently 2 computer generated database available in the US of list of products that is free of the allergens that the patient is allergic to and can safely use. They are the Contact Allergen Management Program (CAMP) which is available for members of the American Contact Dermatitis Society (www.contactderm.org) and the Mayo Clinic's *Contact Allergen Replacement Database (CARD)* (www.AllergyFreeSkin.com)

XII. Metal Implant Hypersensitivity

Table 6. Substances that may be present in different types of implant or device and that potentially should be considered for diagnostic patch testing

Substances or alloy ^a	Implant or device					
	Dental	Orthopaedic		Intravascular	Pacemaker and ICD	Gynaecological
		Pre-implant	Post-implant			
Aluminium	x	x	x	—	x	—
Beryllium	x	—	—	—	—	—
Cadmium	x	—	—	—	—	—
Chromium	x	x	x	x	x	x
Cobalt	x	x	x	x	x	—
Copper	x	—	—	—	—	x
Gold	x	—	—	x	—	—
Indium	x	—	—	—	—	—
Iridium	—	—	—	—	x	x
Iron	x	x	x	x	—	—
Manganese	x	x	x	x	—	x
Mercury	x	—	—	—	x	—
Molybdenum	x	x	x	x	x	—
Nickel	x	x	x	x	x	x
Niobium	x	x	x	—	—	—
Palladium	x	—	—	—	—	—
Phosphorus	x	x	x	—	—	—
Platinum	x	—	—	—	x	x
Rhodium	x	—	—	—	—	—
Ruthenium	x	—	—	—	—	—
Silicon	—	x	x	—	—	—
Silver	—	—	—	—	x	x
Tantalum	—	x	x	—	x	—
Tin	x	—	—	—	—	x
Titanium	x	x	x	x	x	x
Tungsten	—	x	—	x	—	—
Vanadium	x	x	x	—	x	—
Zinc	x	—	—	—	—	x
Zirconium	x	x	x	—	—	—
Custom-made disc of relevant alloy	x	x	x	x	x	—

Schallock1, et al Hypersensitivity reactions to metallic implants – diagnostic algorithm and suggested patch test series for clinical use. *Contact Dermatitis*, 2011, 66, 4–19